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ABSTRACT

The terms "high energy" and "low energy" refer to the amount of energy a wave has that reaches the face of a beach. In this student guide, two types of beaches are investigated. The objective is to be able to identify whether a beach is of high or low energy. Background information is provided, as well as instructions and worksheets for activities on beach profiles, waves, the longshore current, and beach plants. (CW)

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BEACHES IN MOTION

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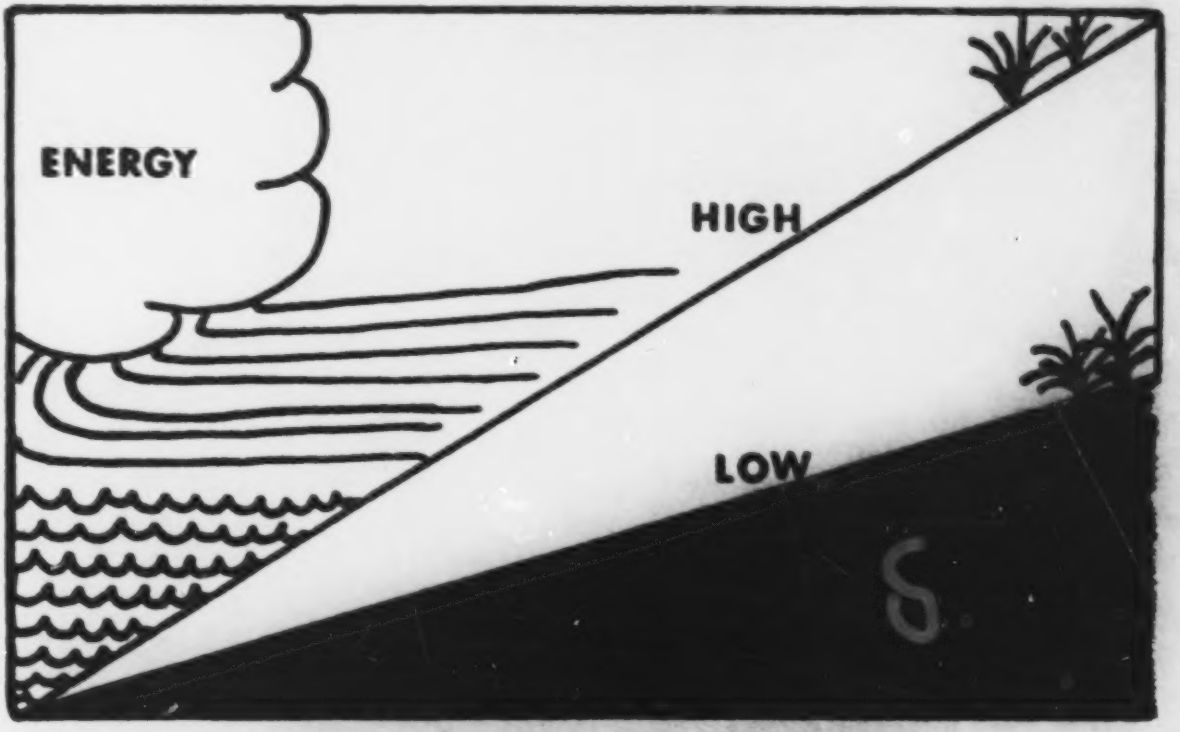


INTERACTION AND ENVIRONMENTAL CHANGE

Secondary

EEIDS

Lee County Schools

SEOSI 774

HIGH AND LOW ENERGY BEACHES

Today you are going to study two types of beaches. If you are accurate in your study, you will be able to identify which beach is a high energy beach and which beach is a low energy beach.

Read the booklet carefully, keep accurate data records and answer all the questions in this booklet.

Talk over any problems that you run into with other students and, if you are still uncertain about your results, discuss the problem with your teacher.

Background Information:

The terms "high and low energy" refer to the amount of energy a wave has that reaches the face of the beach. Some beaches have wide sandbars that absorb much of the wave energy before the wave reaches the face of the beach. Other beaches have narrow sandbars and thus, much of the wave energy is released on the beach face.

Waves move sand along beaches. Waves with high amounts of energy tend to pull sand out to sea, while low energy waves push sand onto the face of the beach.

The following field experiments should help you understand differences between high and low energy beaches. At the end of each exercise, everyone should make certain that all the questions and data tables are complete in your booklets.

1. Beach Profiles

This exercise will aid in showing the degree of incline or slope on the beach.

A. Divide yourselves into groups of four. One student will be the "Recorder", one student the "Sighter" and one student will be the "Marker". The fourth student in the group will be the "Re-checker" and make certain that the measurements are being taken and recorded accurately.

B. The Recorder should record the data that the Sighter and Marker obtain. Use the table for the data on page 4.

C. The Sighter and Marker should get a meter stick with a 2-meter piece of string attached. This will be used as a measuring instrument.

D. The Marker and Sighter should now obtain the data readings. Follow the procedure below. The Recorder should record these readings on the Beach Profile Data Table.

Beach Profile Procedure:

1. Place the meter stick in a vertical position at the water's edge.

2. Now stretch the 2-meter piece of string so that the free end is higher up the beach.

3. Move the end of the string attached to the meter stick up or down, until the string is exactly level with the horizon.

4. The Recorder should now look at where the string meets the meter stick. Record the number of centimeters from the bottom of the meter stick to the string. This will be Reading #1.

5. Now move the meter stick to the point on the beach where the free end of the 2 meter piece of string touched the beach. Repeat numbers 2-4 to get Reading #2.

6. Keep moving the meter stick and the string higher and higher onto the beach. Your last reading should be at or near the point on the beach where the first plants live.

7. Repeat this same procedure when you get to the other beach.

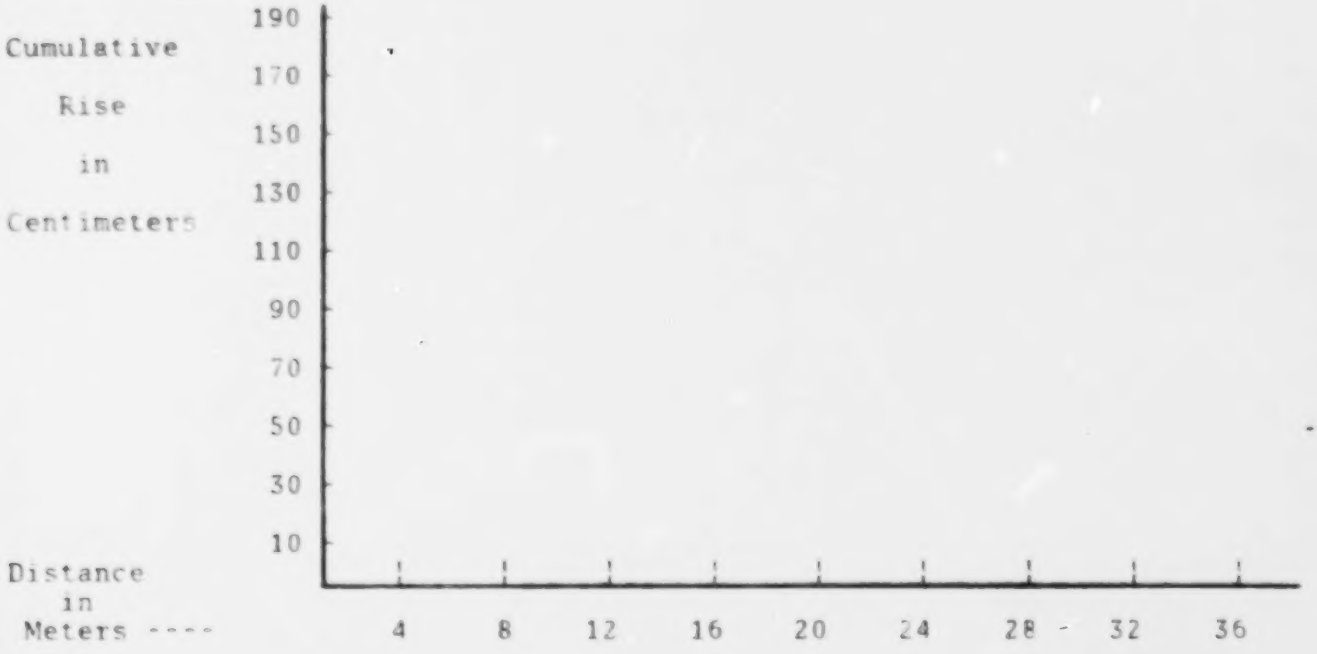
BEACH PROFILE DATA TABLE

Beach One		Beach Two	
Reading #	Rise in Cm	Reading #	Rise in Cm
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
16		16	
17		17	
18		18	
19		19	
20		20	

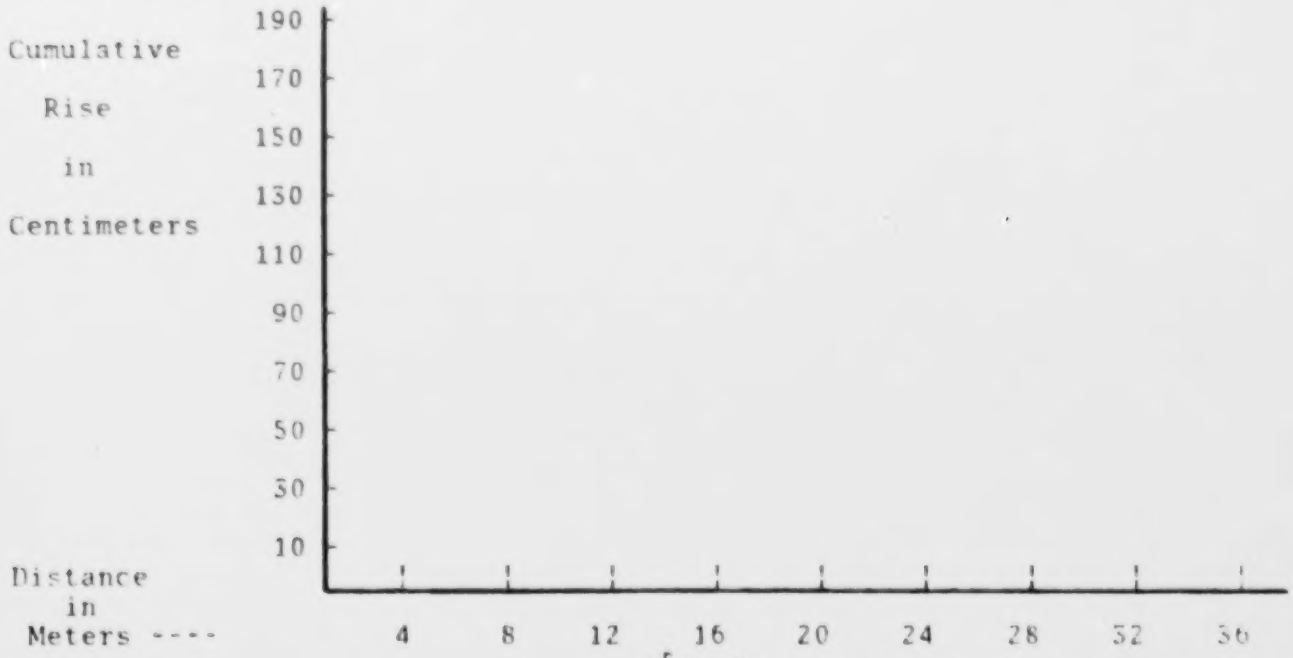
E. Graphing the Profile Data

Make two graphs, one for each of the beaches studied. Remember when graphing the "Rise in centimeters" of the beach, each new reading must be added to the previous reading.

Beach #1 Profile

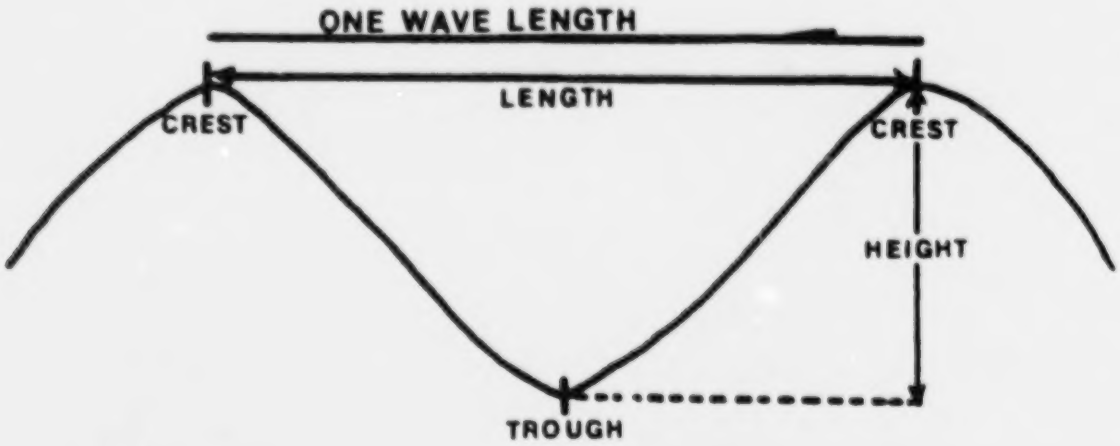


Beach #2 Profile



II. **Waves**

Below is a drawing of a typical wave as it moves onto a beach. Examine the drawing and then locate the parts of a few waves as they move into shore.



Usually, as a wave moves toward a shoreline, the height of the wave increases while the wave length decreases. The width of the off-shore sandbar at a beach affects the increase of the wave height. The energy of the wave is absorbed by the sandbar and, thus, less energy is released on the beach face.

Watch the waves as they break on the shoreline. You can see that most waves hit at an angle, striking one spot on the beach and then moving along the shoreline.

As the wave washes up on the beach and then runs back out again the water moves the loose sand bottom.

Wave Height

Now measure the wave heights at the water's edge. This can be done by standing in the water and, as a wave passes by you, keep tract of where the trough and crest of the wave come in contact with your body. Then measure the distance on your body with the meter stick.

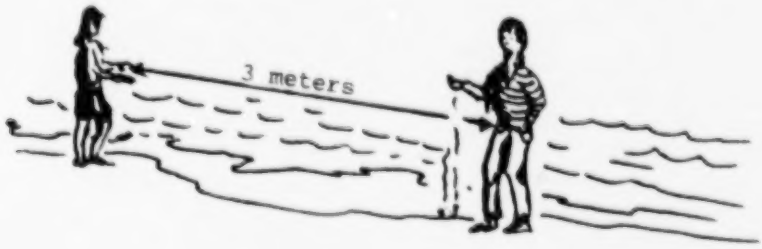
Make three measurement's and record them on the Wave Height Table. Get an average wave height for each beach.

Wave Height Table

Beach #1		Beach #2	
Reading #	Height in Cm	Reading #	Height in Cm
1		1	
2		2	
3		3	
Average		Average	

Measuring Sand Movement:

1. Obtain a handful of colored gravel from your teacher.
2. Have one person stand at a spot at the water's edge.
3. Now observe in which direction the bottom sand is moving along the beach.



4. Have another group member pace off approximately 3 meters from the stationary person.

5. Place the colored gravel in the water so that they will move from one marking person to the next. Record the time it takes the particles to move the 3-meter distance on the Beach Sand Movement Table. Do this exercise three time and then get an average time. Repeat the exercise at the other beach.

Beach Sand Movement Table

Beach #1		Beach #2	
Reading #	Seconds/3m	Reading #	Seconds/3m
1		1	
2		2	
3		3	
Average		Average	

III. The Longshore Current

A narrow current can be found running along the shoreline at most beaches. This current is caused by the wind and the backwash of waves on the beach face. The strength of this current depends on both the wave strength, the wind speed, and directions of both waves and wind.

The longshore current is responsible for moving sand along the shoreline. On our coast of Florida, there is a general longshore current movement toward the south. During certain wind conditions this current can reverse and run northward, but this usually lasts for a very short time.

Most of the sand on the East coast of Florida originally came from the rocks that were ground into sand further north along the east coast of North America. Most of our sand is derived from shells and other rocks.

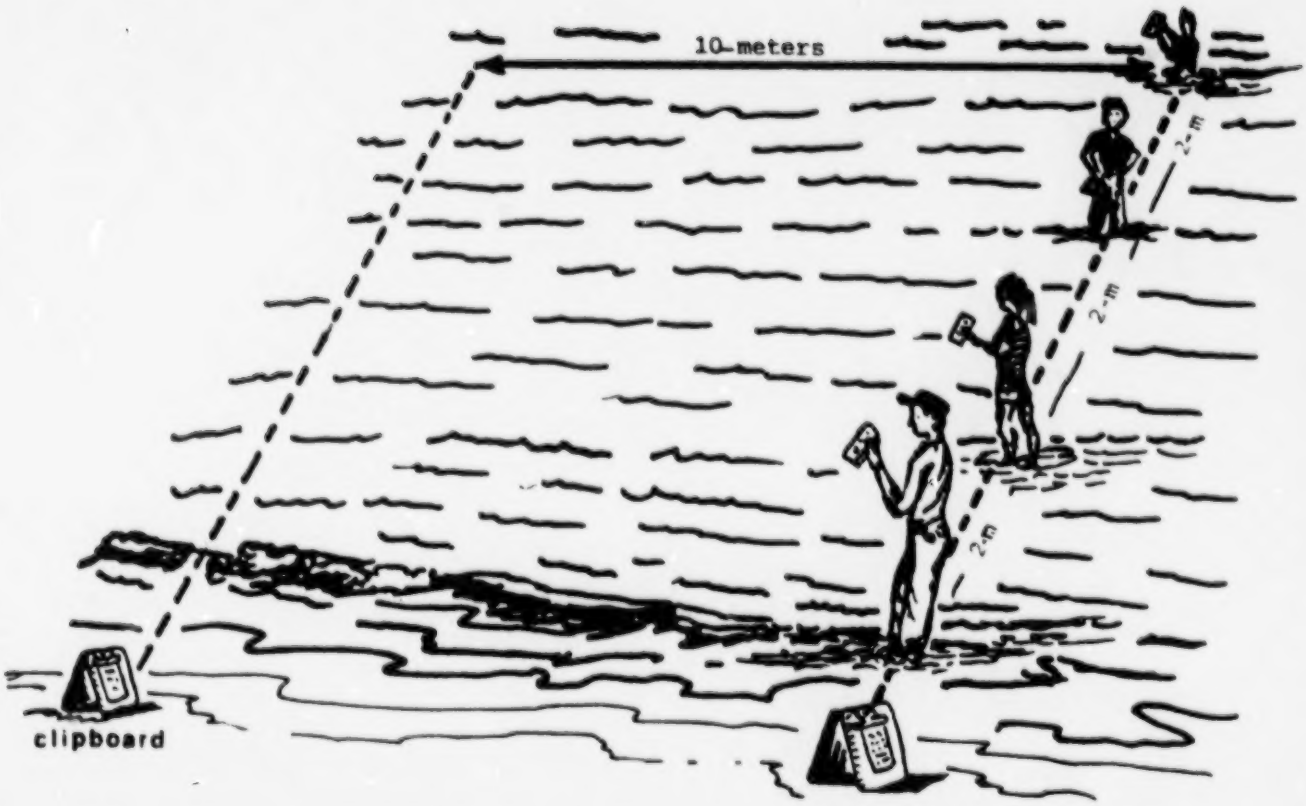
In this exercise we will determine the speed of the longshore current and whether it is moving faster at different distances from shore.

1. Mark off a 10-meter distance of beach by placing a clipboard or other object on the beach; then measure the 10 meters and mark the spot with another clipboard.

2. Each group member should obtain an object that will float low on the water (such as a red mangrove seedling).

3. The members of the group should position themselves approximately 2 meters apart in the water, starting at the shore and reaching out into the water. Each person is responsible for timing the movement of his or her object. Release the objects at the same time and then count the number of seconds it takes your object to move the 10 meters.

4. Be careful not to influence the movement of your object by splashing or attempting to move along with the object.



5. Record the results on the Longshore Current Data Table #2.

Longshore Current Data Table #2

Beach #1		Beach #2	
Position from beach	Number of seconds to move 10 meters	Position from beach	Number of seconds to move 10 meters
2 m		2 m	
4 m		4 m	
6 m		6 m	
8 m		8 m	

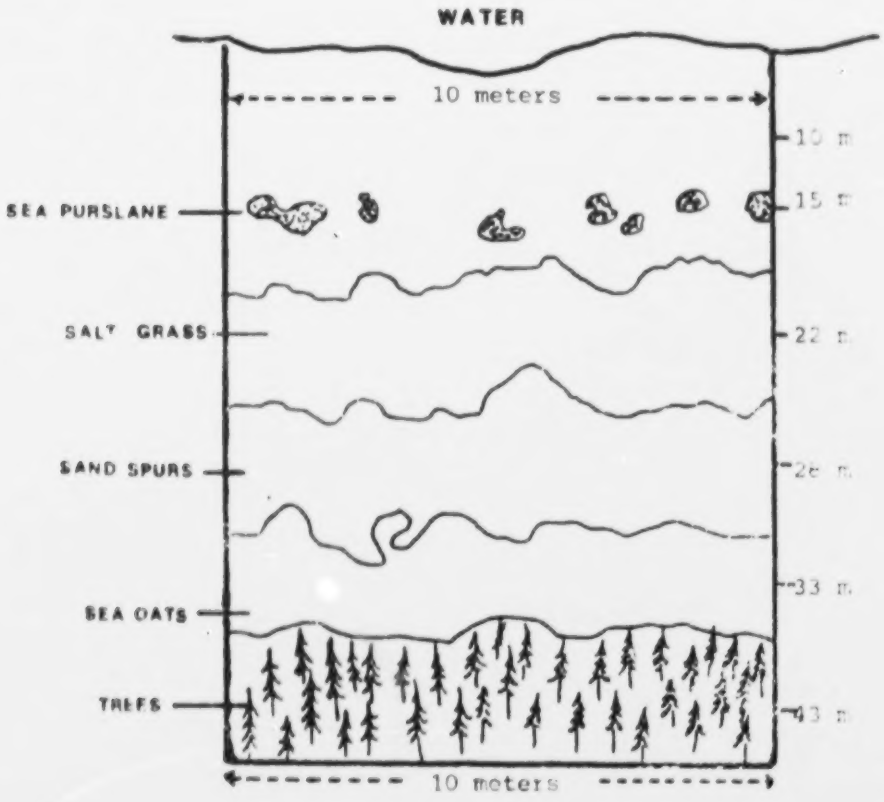
IV. The Beach Plants

Many of the plants that live on the beaches hold the sand in place. They are extremely important factors in preventing erosion.

Plants will generally grow where conditions for their life requirements are met. Obviously, if these requirements are not met, then plants will be absent.

Make a rough vegetation map of the two beaches you studied today. Do not worry about names of plants, only locations of general plant groups. Pictures of some of the major plant types found on our beaches are on pages 12 and 13. Use the pictures to help you label your vegetation maps. On the following page is ;an example of a vegetation map for a beach. Study the map and the way it is constructed and them make your own maps on the pages following.

Vegetation Map - Beach Zero



Sandspur

This is another sand holder on the beach. How do its seeds get around?

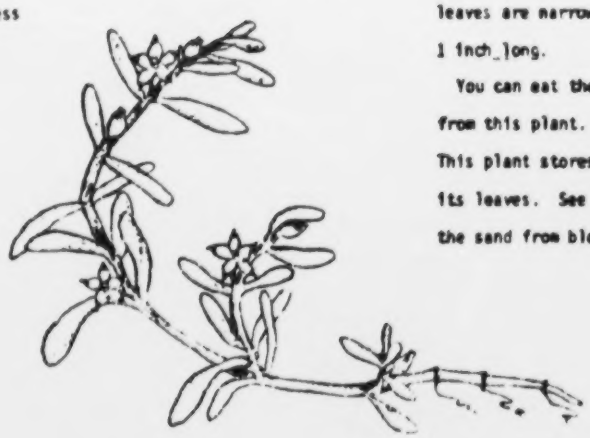
Sea Oats

This plant is about 3 feet tall and grows in thick clumps.

The seeds of this plant can be used to make flour. Sea Oats catch and hold the sand that is blowing in the wind. The Sea Oat helps build the beach.

Salt grass

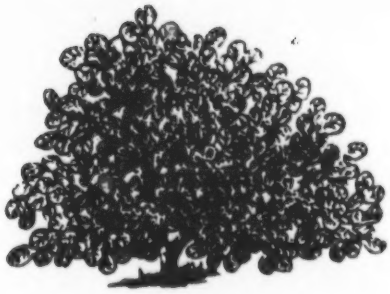
This plant helps hold the sand from blowing away. It looks like grass and stands about a foot or less tall.

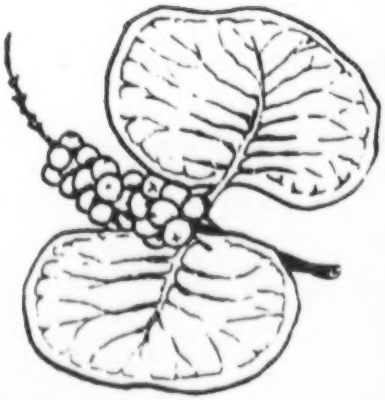


Sea Purslane

This plant grows very close to the ground. Its leaves are narrow and about 1 inch long.

You can eat the leaves from this plant. Try one. This plant stores water in its leaves. See how it holds the sand from blowing away





Sea Grape

The fruit of this tree can be eaten when it gets red. Some people make jelly from this fruit.

Australian Pine

The wood of this tree is so hard that it is sometimes called the Break ax tree. It grows very fast and is not really a pine tree. Notice its seed pods. The branches that look like needles and the seed pods that look like cones have fooled many people into thinking this is a pine tree. The tree is about 50 to 75 feet tall.

Vegetation Map - Beach #1

Vegetation Map - Beach #2